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COMMISSIONERS

October 25, 1996

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: *EX PARTE* MEETING, CC DOCKET NO. 96-45, FEDERAL-STATE JOINT BOARD ON UNIVERSAL SERVICE

On October 20, 1996, Joel Shifman of the Maine Public Utilities Commission in Augusta, Maine participated in a panel discussion at the United States Telephone Association Annual Convention with a staff member of the 96-45 (section 254) Federal-State Joint Board and staff member of the Federal Communications Commission. At that meeting, Mr. Shifman referenced a follow-up paper which was produced by the National Regulatory Research Institute which discussed some of the problems Mr. Shifman found with the existing proxy models currently under consideration. Ten copies of a draft of that paper is enclosed for your reference.

If you have any questions or require additional information, please feel free to call me.

Sincerely,

Joel Shifman

JS/nlp
Enclosure

DRAFT

NRRI 96-29

The National Regulatory Research Institute

IMPROVING PROXY COST MODELS FOR USE IN FUNDING UNIVERSAL SERVICE

David Gabel, Ph.D.
Queens College

October 1996

This paper is one of a series of focused and timely NRRI analyses of high-priority issues in state telecommunications policy that derive from passage of the Telecommunications Act of 1996, which creates both challenges and opportunities for state regulators. The views and opinions expressed herein are those of the author. They are not necessarily those of The National Regulatory Research Institute, the National Association of Regulatory Utility Commissioners (NARUC), or any NARUC-member Commissions.

EXECUTIVE SUMMARY

The Telecommunications Act of 1996 calls for consumers in all regions of the country to have access to telecommunications and information services at rates that are reasonable compared to those in urban areas. Rural, insular and high-cost areas will continue to need supplementary funding from a central source if they are to be able to offer services and rates similar to those in urban areas. This paper recommends a change in the methodology used to measure the cost of universal service and addresses some data problems with existing cost models.

In its consideration of universal service funding, the Federal-State Joint Board in FCC Docket 96-45 must, among other things, determine the cost of providing basic telephone service in high-cost areas in order to determine the appropriate level and method of funding. The Joint Board is in the process of approving a funding mechanism which will require the transfer of billions of dollars in revenue. Establishing cost models that accurately reflect the variations in cost for different areas of the country is a vital issue, not only for universal service, but for access charge reform and other policies which are necessary to establish the Act's primary goal, that is, to open telecommunications markets to competition. For the board to make a sound decision in this area, basic improvements in cost models are necessary.

Current models (the Benchmark Cost Model and the Hatfield Model) identify the average cost of providing service to all consumers, but in measuring the profitability of providing universal service, they consider only the revenue derived from residential exchange service. The methodology used by Oftel in the United Kingdom should be used instead because it mirrors the approach used by firms in evaluating the profitability of a line of business and considers the impact of one product on other lines of business. The methodology is customer-based and identifies both avoidable costs and revenues.

The total service long-run incremental cost of residential service is the cost of adding residential service to a network that already provides business services,

including both switched business and private line services. Neither the Benchmark nor Hatfield models have been used in a manner consistent with this methodology.

If only residential services are being considered suitable for a universal service subsidy or support, the cost analyst should compare the incremental cost of the service with its revenue. If a family of products is being studied, the analyst should compare the family's incremental costs and revenues. If the family's costs exceed its revenues, then it is being subsidized. The methodology used by the Benchmark and Hatfield models is flawed because it compares the average cost of all services with the incremental revenue from a subset of the services. Either the revenue considered should take into account all services, including revenue derived from business customers, or the cost study should consider only the incremental cost and revenue of residential service.

If all customers in high cost areas qualify for support, including business customers, than it is appropriate to use average costs for identify the level of support.

When measuring the difference between avoided costs and revenues, the analyst might also take into consideration the life cycle of customers' behavior. While a customer or geographic area may not be profitable today, a local exchange carrier (LEC) may still find it profitable to provide service because of the potential future earnings. Neither the Hatfield nor Benchmark models reflect these life-cycle effects or corresponding benefits. These omissions may lead to an overstatement of the cost of providing universal service.

The National Exchange Carrier Association (NECA) has compared the loop cost estimates of the Benchmark model with the embedded costs that are used to determine eligibility for the high-cost fund. NECA found that the proxy model estimates for smaller companies vary greatly from actual costs, which could be devastating for them. Furthermore, there is considerable evidence to suggest that the economic cost-of-production is less than the embedded cost, so that the ability to track embedded costs may indicate systematic error.

The paper contains specific recommendations on data inputs:

- No cost model should be used to set the universal service fund until the developers of the model provide better documentation
- Cost estimates of structural investment (that is, poles and conduit) should reflect suppliers' practices
- Although conclusions cannot be reached for the Hatfield model on cost variations for topography, for the Benchmark model it appears that a different mix of operations for installing facilities should be used
- Differences in costs for aerial, underground and buried cable and whether the cable is fiber or copper should be used to calculate maintenance loading factors.
- Appropriate assumptions should be made on the current and future mix of aerial or below-ground facilities
- Information currently available suggests that adjustments should be made in calculations of non-investment related expenses
- Wire-center boundaries, as well as census block data, should be used as fundamental units of analysis in the costing model used to set universal service funding
- The central processor should not be treated as exclusively a line-related investment.
- The existing models should be modified to reflect the cost of the type of switching technology that is actually used in low-density areas.

ACKNOWLEDGMENTS

Many individuals helped me obtain information for this paper. While my gratitude extends to many, I want to give special thanks to Joel Shifman of the Maine Public Utilities Commission, Ron Choura of the Michigan Public Service Commission, the developers of the BCM2 model, Peter Copeland of US West and Jim Dunbar Jr. of Sprint, as well as the employees of Hatfield Associates. This paper has benefited greatly from the assistance of Janet Schloss and Scott Kennedy.

INTRODUCTION

The Telecommunications Act of 1996 calls for consumers in all regions of the country to have access to telecommunications and information services at rates that are reasonable compared to those in urban areas.[1] Rural, insular and high-cost areas will continue to need supplementary funding from a central source if they are to be able to offer services and rates similar to those in urban areas.

In its consideration of universal service funding, the Federal State Joint Board in FCC Docket 96-45, must, among other things, determine the cost of providing basic telephone service in high-cost areas in order to determine the appropriate level and method of funding. Establishing cost models that accurately reflect the variations in cost for different areas of the country is a vital issue, not only for universal service, but also for access charge reform and other policies which are necessary to establish the Act's primary goal, that is, to open telecommunications markets to competition. For the board to make a sound decision in this area, basic improvements in the modeling are necessary.

The Joint Board is in the process of approving a funding mechanism which will require the transfer of billions of dollars in revenue. In this paper I recommend a change in the methodology used to measure the cost of universal service, and also address some data problems with the existing cost models.

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[1] Section 251 (b)(3) ACCESS IN RURAL AND HIGH COST AREAS.-- Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including interexchange services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas.

Methodological Problems

The universal service costs estimated by the existing proxy cost models are fundamentally inadequate to address the magnitude of the universal service obligation. The studies essentially ask the question: what is the relationship between the price of exchange service and the cost of the loop, the switch, and the interoffice facilities that are used not only for providing exchange service, but also other switched services?

The models identify the average cost of providing service to all consumers, but in measuring the profitability of providing universal service, they consider only the revenue derived from residential exchange service.[2] This methodology is flawed because:

- The models do not identify the incremental cost of residential service. Since they measure the shared cost of providing business and residential service ("consumers"), both revenues, not just residential revenue, are relevant.
- The models do not use an avoidable cost / foregone revenue approach. Typically, the average cost is compared to the average residential exchange price (circa $20). However, residential bills are generally much higher than this. Yet the models fail to take these relevant revenues into account, while they simultaneously include some costs for non-universal service products. For example, the models include the cost of providing call- waiting, but do not explicitly include the revenue.
- Reed Hundt, the Chairman of the Federal Communications Commission, has recognized the reasonableness of a methodology that considers the incremental revenues derived from residential customers, and the adoption of this methodology by Oftel in the United Kingdom:

> And where subsidies are needed for the poor or the very high cost area, as OFTEL has demonstrated for the U.K., they are modest. That is because telephone operators receive commercial benefits from broader network coverage. The benefits of broader coverage

[2] "Consumers" are interpreted to mean both residential and business customers. Elsewhere the law expressly recognizes "residential" customers [see, for example, §227(B)]. §271(c)(1)(a) expressly identifies "residential and business subscribers."

> off set some of the costs of uneconomic connections to some homes and regions.[3]

The Oftel methodology merits careful attention because it mirrors the approach used by firms in evaluating the profitability of a line of business. Furthermore, when a firm evaluates the profitability of a product, it considers not only the direct incremental costs and revenues, but also the impact of the product on other lines of business. This has been the approach adopted by some national regulatory agencies in other countries which have addressed the cost recovery for provision of universal service issue.[4]

In December 1995, OFTEL offered the following description of the method it uses to calculate the cost of a local exchange company's universal service obligation:

> OFTEL's approach to calculating the costs of universal service in the United Kingdom is generally to identify and establish the cost to [a LEC] of customers whose revenues, including revenues from incoming calls, falls short of the long run avoidable costs of providing them with service. The estimated value of the benefits of being the universal service provider is then subtracted.[5]

Oftel's position is a restatement of a more detailed policy described in its December 1994, Consultive Document, and codified in a July 1995 Statement by the Agency's Director General. Appendix C of the December Consultative Document described how the cost of universal service should be measured:[6]

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[3] "Seven Habits of Hopefully Highly Successful Deregulatory Communications Policy People." Royal Institute of International Affairs, London, England, September 4, 1996.

[4] This economically rational methodology has also been endorsed by the regulatory agencies of Hong Kong and Australia. Australia Bureau of Transport and Communications Economics, *The Cost of Telecom's Community Service Obligations*, Report 64, September 1989; and Office of Telecommunications Authority, *Universal Service Arrangements: A Further Considered View,"* Discussion Paper, 1 August 1996.

[5] See, Oftel, "Universal Telecommunications Services: A Consultative Document on Universal Service in the UK from 1997 (December 1995), Par. 9.3.

[6] Oftel, "A Framework for Effective Competition: A Consultative Document on the future of interconnection and related issues," December 1994. This consultative document is equivalent to an FCC "Notice of Proposed Rulemaking." After receiving comments from interested parties, in July 1995, Oftel issued "Effective Competition: Framework for Action: A Statement on the Future of Interconnection,

C.8 The preferred methodology is along the lines of the approach adopted in Australia for the costing of the USO (published in *The Cost of Telecom's Community Service Obligations*, Bureau of Transport and Communications Economics, Report 64, September 1989). With this methodology the revenue, net of costs, is calculated for each customer or group of customers. The cost of the USO is the sum of the negative net revenues.

C.9 The methodology is a **customer-based** [original emphasis] approach and should in principle include all services...

C.10 The costs relevant to each customer are the **long run avoidable costs** [original emphasis] of supplying that customer--the costs that would be avoided if the customer were not supplied. These will include the operating and maintenance costs incurred, but also depreciation and capital charges on assets which would require replacement in the long term...

C.13 The relevant revenues are those that would be foregone if the customer were not connected to the telephone network. This principle implies that **incoming calls should be included in addition to outgoing calls.** [original emphasis]...

C.15 In arriving at the total cost of the USO, the following may need to be considered. The more customers that are included, the larger the avoidable costs are likely to be, so it might be that the operator could save more by not serving a whole block of customers, even if some of those customers have positive net revenues. The calculation mechanism should, therefore, be iterative including an examination of the effects of excluding groups of customers from the network, perhaps even all those served by an exchange, as well as individual customers. It may also be that, when the whole group of negative net revenue customers ahve been identified, some further costs might need to be included that the operator would avoid if it were to exclude all those customers.

C.16 The consultants should also consider the impact of factors beyond those determining current financial viability. For example, a lifetime approach to revenue (allowing for the possibility that currently unprofitable customers might become profitable in the future), the goodwill generated and the value of the ubiquity to the provider of the USO.

Competition and Related Issues." The Statement is equivalent to an FCC order. The Statement includes a description of Oftel's costing study (paragraphs 4.20 to 4.28).

I recommend that the same methodology be adopted by the Joint Board, the Oftel costing approach is considerably different from the methodologies embodied in the Hatfield and BCM2 models. Oftel uses economic analysis to assess the cost of providing universal service. This standard has emerged around the world because it reflects the type of information that a business would use to appraise the profitability of an undertaking. In a non-regulated market, a commercial operator would measure the benefit or burden of a service by comparing its incremental costs and revenues. This framework, which is used by unregulated businesses, should be the one used to appraise the burden of the universal service obligation.

The purpose of the avoided-cost methodology is to identify those expenses that would not be incurred if an area or a group of customers no longer received service. In the process of developing the avoided costs, joint and common costs that are unavoidable are not included in the measurement of the direct cost of providing universal service products. As shown in the figure 1 below, the methodology identifies both the avoidable costs and revenues. The foregone revenues include not only exchange revenue, but also earnings from toll and vertical services. The revenue calculation must also take into account the revenue derived from calls made to the universal service customers.[7] This same criteria was used by AT&T during the competitive, unregulated period at the start of the twentieth century.[8] Therefore, the adoption of incremental analysis to determine USO funding is consistent with the behavior of competitive and unregulated telecommunications planning criteria and "best-practice" regulatory procedures.

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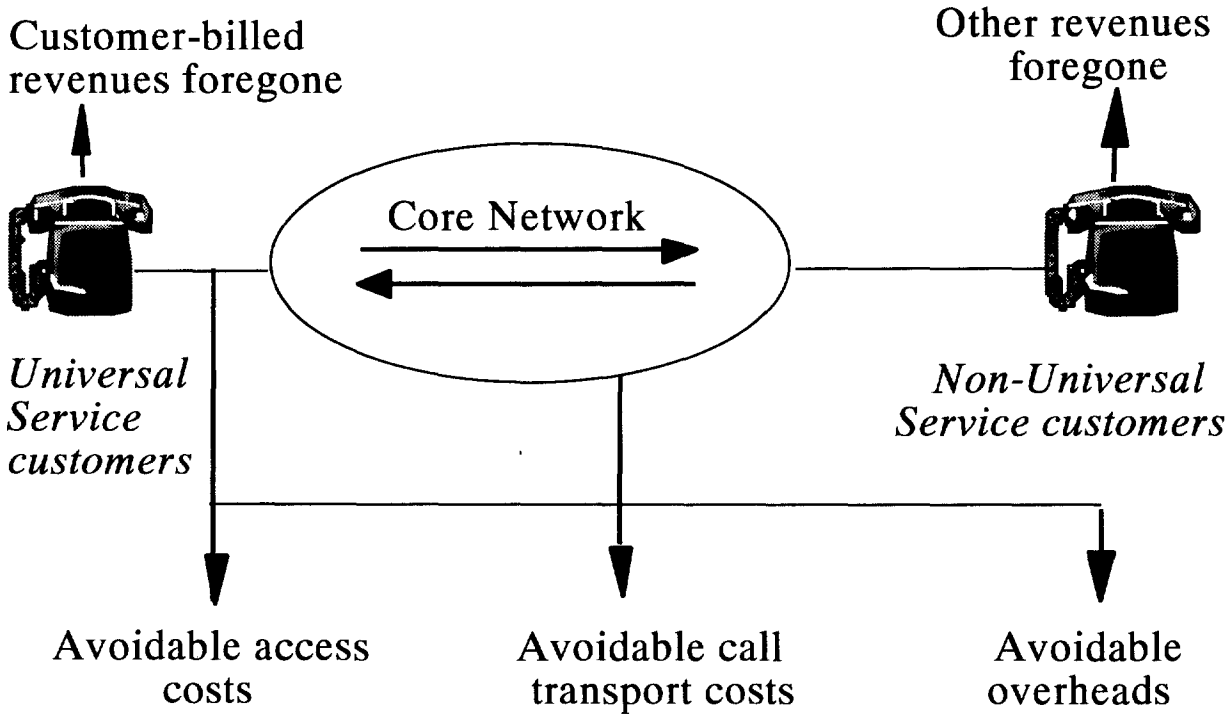
[7] Oftel (United Kingdom), "A Framework for Effective Competition," Appendix C, Par. C13, December 1994.

[8] See, David Gabel, "An Assessment of Universal Service," submitted to the Joint Board October 1, 1996 as Ex Parte Comments CC Docket No. 96-45, State of Florida, Office of the Public Counsel.

Figure 1: Avoidable Costs And Revenues Foregone Of Serving Customers



Using Incremental Cost Data to Test for Subsidies and the Need for Support

Much of the discussion regarding universal service has focused on the profitability of providing service to residential customers. Residential customers have been the focus of attention because of the concern that consumers in high-cost areas and low-income neighborhoods would terminate service if prices were set equal to the cost of providing universal service products. If these residential customers do not generate enough revenue to cover the cost of providing them service, they are receiving a subsidy.

A precise definition of a subsidy can be found in Gerald Faulhaber's classic article, "Cross-Subsidization: Pricing in Public Enterprise."[9] Faulhaber proposed that total service long run incremental cost (TSLRIC) should be used to test for service subsidies. As long as a group of consumers, such as residential customers, are generating additional revenue that exceeds the cost of including them on the network, this group is not being subsidized in any way by other groups of customers or other services.

An economically valid estimate for the existence of a subsidy, using the TSLRIC criteria, must reflect the fact that business and private line services would still exist if residential service were eliminated. If a local service network operator did not offer residential service, perhaps because it believed that it was not viable and there was no requirement to do so, it would nevertheless still wire many areas of the country in order to provide service to businesses.

Therefore, the TSLRIC of residential service is the cost of adding residential service to a network that already provides business services, including both switched business and private line services. This means that the TSLRIC of residential service would be the cost of wiring areas containing only residential neighborhoods, as well as the cost of installing larger cables in regions that would otherwise still be wired in order to provide service to business customers. This methodology is consistent with the

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[9] Gerald Faulhaber, "Cross-Subsidization: Pricing in Public Enterprise," American Economic Review, December 1975, pp. 966-77.

economic principle that the incremental cost of providing a service is the cost that would be avoided if this one service were discontinued, while all other services continued.

Neither the Benchmark nor Hatfield models have been used in a manner consistent with this methodology. They estimate the cost of serving different areas, but they do not identify the incremental cost of serving residential customers. Rather than identify the incremental cost-of-production, these studies estimate the average cost-of-production. The models estimate the total cost of installing loops, then divide this quantity by the number of working loops.[10] This quotient is an average cost, not the TSLRIC of a service.

The difference between average and incremental cost can be loosely approximated with some data generated by BCM2. The consulting firm of Economics and Technology has used the BCM2 to estimate the cost of serving the State of Washington under three conditions:[11]

- Network A — "A stand-alone network sized to support only first residential access line demand."
- Network B — "A stand-alone network designed to support all services *other than the* initial residential access line." (Business lines and second residential lines)
- Combined Network: — A network that is provisioned for residential first and second lines, as well as business lines.

The data presented by Economics and Technology, as summarized in the Table below, suggest that the incremental cost can be as little as one-half the average cost-of-production.[12]

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[10] See, for example, "Benchmark Cost Model," A Joint Submission of MCI, NYNEX, Sprint, and US West, CC Docket No. 80-286, December 1, 1995

[11] Susan M. Baldwin and Lee L. Selwyn, "Converging on a Cost Proxy Model for Primary Line Basic Residential Service," Economics and Technology, August 1996, p. 106.

[12] The average value was derived by dividing the total investment, $3,501,878,128, by the number of combined lines, 3,293,923. ETI reports that the stand-alone cost of network B is $2,563,892,069. Therefore the additional investment for serving the first residential line is the difference between the investment for a combined network and a network that only serves business and second line residential customers: 3,501,878,128 - 2,563,892,069 = 937,986,059. ETI reports that there are 1,875,508 households in Washington, and therefore the TSLRIC of the first residential line is 937,986,059

Table 1: Investment Per Line: State of Washington

Average Investment per Line on combined network	$1,063
TSLRIC Investment per Residential Line	$500

Source: Data Derived from BCM2 Results as Reported by ETI, August 1996

If only residential services are being considered suitable for a universal service subsidy or support, the cost analyst should compare the incremental cost of the service with its revenue. If a family of products is being studied, the analyst should compare the family's incremental costs and revenues. If the family's costs exceed its revenues, then it is being subsidized. The Benchmark and Hatfield models identify the cost of providing both business and residential loops, rather than the incremental cost of offering only residential loops. This being the case, the revenue from all the services that use the loop, not just residential exchange service, ought to be used when comparing costs and revenues. The methodology used by the Benchmark and Hatfield models is flawed because it compares the average cost of all services with the incremental revenue from a subset of the services. Either the revenue considered should take into account all services, including revenue derived from business customers, or the cost study should consider only the incremental cost and revenue of residential service.

The Hatfield and Benchmark models aggregate business and residential loops when estimating the cost-of-service. Costs that are considered shared in the individual service studies may become direct in the aggregated studies. For instance, if a company offers two classes of service (e.g.; business and residence) and it studies the cost of those services separately, the fiber feeder cable is not likely to exhaust and it may properly be considered a shared cost in each study. The cable would not be

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/ 1,875,508 = $500.

I have used the Local Exchange Cost Optimization Model to evaluate the relationship between the TSLRIC and average cost-of-production. I generally do not find there to be as large a difference between average and incremental costs as is suggested by the results presented by ETI. See, for example, David Gabel, "Is Residential Telephone Service Subsidized? Moving Past the Rhetoric Through an Empirical Analysis of the Cost and Revenue Associated with the Kiwi Share." TUANZ Universal Share Obligation Conference, Auckland, New Zealand, July 1996.

directly attributable to either service. But, if customer access is the "service" in question, then the fiber feeder cable may properly be considered a direct cost of access service.

Each time a copper or fiber cable is installed, certain fixed costs per foot are incurred. In many places, this fixed cost is not part of the TSLRIC of residential services because the same expenditure would be required for business service. In such locales, the TSLRIC of residential service should include only the incremental expense of additional pairs of cable and should not include the fixed cost per foot of installing the cable. The TSLRIC of residential service is the cost which would be avoided if any LEC continued to provide private line and switched services to business customers. Neither the Hatfield nor Benchmark models estimate this incremental cost; instead they report the average cost-of-service.

The difference between incremental and average costs is nicely summarized in the seminal cost study undertaken by the Australian government, "The Cost of Telecom's Community Services Obligations:"

> The difference between the avoidability and FDC [fully distributed, or average cost] approaches essentially lies in the treatment of joint or common costs. In the avoidability approach, only avoidable costs are included in the [universal service] cost measure; in the FDC approach, all costs are allocated whether or not they would be incurred if [universal service] had not been provided. There is also a major difference in the treatment of revenue. In the avoidability approach incoming call revenue is included as well as outgoing call revenue, resulting in higher revenue being considered than in the FDC approach.[13]

This incremental methodology has not been adopted by the sponsors of the Hatfield and BCM2 models.

An Alternative Approach

The 1996 Act states that regardless of their location, all consumers, not just residential, should be able to obtain service as prices "that are reasonably comparable

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[13] Australian Bureau of Transport and Communications Economics, "The Cost of Telecom's Community Service Obligations," (Canberra, 1989), p. 17.

to rates charged for similar services in urban areas." §251 (b)(3) This wording suggests that support should be provided to business, as well as residential, customers in rural, insular, and high cost areas. If support is provided to both residential and business customers, both types of subscribers should be included in the support calculation, not just residential lines. If support is provided to both set of customers, the appropriate cost standard is average, not incremental costs. Average costs are appropriate with this scenario because all classes of customers, not just residential, qualify for support. Since all customers qualify for support, the relevant cost are total forward looking costs, not just the avoided costs associated with incremental residential loops.

The Hatfield and BCM2 models only include residential lines in their final calculation of support. For example, after determining the cost of serving all customers, BCM2 calculates the support requirement by subtracting from the benchmark rate the monthly cost of serving a line in a CBG (census block group). This difference is then multiplied by the number of households in a CBG.[14] The support calculation does not take into account the number of business lines and therefore makes no provision for providing support to business consumers in high-cost areas.

The Rural States Coalition has suggested that the support be based on the difference between the cost of serving consumers in urban and high-cost areas. They suggest that cost, rather than rates, be used for the support calculation because it is difficult to compare rates between localities because of the vast difference in calling areas. Since the calling zones in urban and suburban area differ significantly, comparable rates are not equivalent to comparable value. A $10 rate in an urban area may provide access to considerably larger number of subscribers than a $10 rural rate, and therefore does not constitue comparable telecommunications service at comparable rates. This difference would conflict with the statutory requirement of §251(b)(3).

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[14] See cell FR3 in the main program of the BCM2 model

The Rural States Coalition proposed that the subsidy be based on the difference in the average cost of serving urban and high-cost area subscribers. If this method is pursued, and the support is provided to both residential and business consumers, the BCM2 and Hatfield models must be modified so that the support mechanism takes into account both business and residential lines. The support would be calculated by subtracting from the cost of serving urban customers from the monthly cost of serving a line in a high-cost CBG. This difference would then be multiplied by the number of households and businesses in a CBG.[15]

Life cycle effects

On page 4 I provided a summary of the universal service methodology adopted by Oftel. Paragraph C16 of the Oftel document notes that when measuring the difference between avoided costs and revenues, the analyst might also take into consideration the life cycle of customers' behavior. While a customer or geographic area may not be profitable today, a LEC may still find it profitable to provide service because of the potential future earnings. As discussed in a report commissioned by the United Kingdom's regulatory agency, OFTEL, unregulated firms continue to provide service to some unprofitable customers because of the belief that service to these customers may eventually become profitable to serve and in order to avoid harm to the corporation's image:

> The sheer number of uneconomic residential lines... (10 percent of residential lines) or ... (9 percent of residential lines) makes it seem unlikely that BT [the LEC] would withdraw from this activity even if it were allowed to. However, we must address the serious commercial issue as to whether BT would behave in this way if the universal service activities were subject to normal competitive pressures.
>
> BT, like any other commercial company operating a primarily subscription-based service (e.g.; a bank or building society), could be expected voluntarily to carry a

[15] This description assumes that only the first line in a household or a business would qualify for a subsidy. If all lines qualified for a subsidy, the formula would have to be adjusted accordingly.

certain number of customers who are 'uneconomic' at a given moment in time. Studies in the building society sector [footnote omitted] indicate that about 40 percent of ordinary accounts are uneconomic at any one moment. Of these, about three quarters are expected to become economic at some future moment, through an increase in the account balance or the purchase of related services such as a mortgage. This leaves a 'hard core' of 25 percent of unprofitable customers (or about 10 percent of all customers) which the building societies could, in theory, get rid of in order to increase their short-term profitability without putting future business at risk.

It can be argued that telecoms and savings are very different businesses, with different cost and revenue structures. However, these differences mainly relate to the higher proportion of uneconomic customers (40 percent in building societies versus 9 percent or 10 percent among telecoms customers), rather than the proportion of these customers which a firm in a competitive market might want to retain (75 percent). This latter figure, which building societies have calculated primarily using consumer life-cycle effects, might apply to any industry which addresses a national mass consumer market on an almost indiscriminate basis.

In practice, only one building society, the Halifax, has recently taken public action to encourage customers to close uneconomic accounts (and then only for a limited period). Building societies know which accounts are uneconomic, but in general they take little or no action to close these accounts, because:

1) uneconomic accounts may become economic in the future
2) uneconomic accounts may lead to other profitable business
3) closure of uneconomic accounts may adversely affect other accounts or alternatively some uneconomic accounts may positively contribute to the corporate image.

The first two of these points are life-cycle effects; the last relates to corporate image which has been discussed above.[16]

Neither the Hatfield nor Benchmark models reflect these life-cycle effects or corresponding benefits. These omissions may lead to an overstatement of the cost of providing universal service.

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[16] Analysis, "The Costs, Benefits and Funding of Universal Service in the UK," 19 July 1995, pp. 22-27. See, also, Oftel, "Universal Telecommunications Services: A Consultative Document on Universal Service in the UK from 1997 (December 1995), chapter 9.

Accuracy of proxy models

The National Exchange Carrier Association (NECA) has compared the loop cost estimates of the BCM with the embedded costs that are used to determine eligibility for the high-cost fund.[17] NECA found that the proxy model estimates "for smaller companies vary greatly from actual costs. These variances, which are due in part to 'mapping' problems between census block groups and actual operating territories of small companies, may not be a significant problem for larger companies because the errors produced by the models tend to 'average out' over the large number of census block groups served by these companies. For smaller companies, serving only a few census block groups, such errors can be devastating."[18]

Overall, NECA found that the BCM2 tracked well with the embedded cost-of-service. Based on an analysis of 1,386 out of 1,439 separations study areas, the association found that the model estimated an annual cost per loop of $277, $35 greater than the embedded cost of $242.[19] Some proponents of the BCM2 have suggested that the small differences between the embedded and the current estimated cost are a sign that the model is accurate, because embedded costs are the standard against which proxy models should be evaluated. If matching embedded costs were a sign of a good model, there would be a reduced need to develop engineering economic

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[17] The BCM2 model was not designed to yield estimates of the required level of explicit subsidy. The model's sponsors have stated that it is designed to estimate relative costs, not cost levels. The use of the model should be limited to identifying the relative cost of serving different areas, which is actually what its sponsors consider the appropriate use of its output to be. But even here, some caution should be exercised due to the concerns raised herein.

[18] *In the Matter of Common Carrier Bureau Seeks Further Comment on Specific Questions in Universal Service Notice of Proposed Rulemaking*, CC Docket No. 96-45, National Exchange Carrier Association, "Further Comments," August 2, 1996, p. 22.

[19] Ibid., p. 5. Similar findings have been made by other parties. For example, Southwestern Bell reported that the BCM2 reported higher economic investments and expenses for the loop than the embedded cost-of-service in four out of the five states it serves. *In the Matter of Common Carrier Bureau Seeks Further Comment on Specific Questions in Universal Service Notice of Proposed Rulemaking*, CC Docket No. 96-45, "Supplemental Comments of Southwestern Bell Telephone Company on Cost Proxy Models," August 9, 1996, pp. 6-7.

models. If embedded costs are the correct standard, then they should be the starting point for setting rates.

Since the BCM2 tracks well with embedded costs, the question naturally arises. Is it the case that there is little difference between the embedded and economic cost-of-production? There is considerable evidence to suggest that the economic cost-of-production is less than the embedded cost. Telephone company cost studies have shown that the cost of the loop has been decreasing over time. For example, cost studies undertaken by Indiana Bell indicate that between 1984 and 1992, the marginal cost of providing a local loop declined by 8.1% per annum in logarithmic terms.[20] In the unbundling docket at the FCC, the USTA noted that the economic cost-of-production continues to go down. The trade association suggested that the difference in the cost-of-production was in the range of $13 billion to $18.4 billion.[21]

A primary catalyst in the decline of the loop cost is the reduction in the price of the digital line carrier. This decrease in the digital line carrier expense has two effects on loop costs. The first order effect is that the investment for subscribers who are served by digital line carriers should be falling. In 1992, New England Telephone reported that the cost of Subscriber Line Carrier (SLC) 96 was $11,248.[22] In 1986, NET told the Massachusetts Department of Public Utilities that the cost of the equipment was considerably higher: "SLC technology multiplexes a signal, allowing as many as 96 lines to be carried on only ten (10) physical lines...SLC technology does require multiplexing/demultiplexing technology at either end at an average cost of $51,000 per

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[20] Prepared Testimony of David Gabel, Cause No. 39705, Indiana Utility Regulatory Commission, January 1994.

[21] In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-325 and 96-98; and *Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers,* CC Docket No. 95-185, First Report and Order, Adopted: August 1, 1996, Released: August 8, 1996, paragraph 641, footnote 1563, and paragraph 658.

[22] New England Telephone, Maine Public Utilities Commission, Docket 92-130, Marginal Cost Study, Tab IV, Table 2.1.